

positioning at least one cassette containing the substrates, the location having an upper region which is open to a cassette transferring path;

a vacuum loader; and

a lock chamber, having an atmospheric loader side and a vacuum loader side, and having a gate valve for said atmospheric loader side and another gate valve for said vacuum loader side,

wherein said vacuum loader has

(1) a transfer chamber connected to the lock chamber via the another gate valve, the method comprising the steps of:

transferring substrates, to be processed, from said atmospheric loader, from a cassette at said location, to said lock chamber;

after transferring substrates to the lock chamber, providing a vacuum in said lock chamber;

after providing a vacuum in said lock chamber, transferring substrates to be processed, from said lock chamber to said transfer chamber;

thereafter, transferring processed substrates from said transfer chamber to said lock chamber; and

transferring processed substrates from said lock chamber to said atmospheric loader from which the substrates had been transferred to the lock chamber,

wherein said gate valve and said another gate valve are opened and closed every carrying-in of a substrate, to be processed, to the lock chamber, and every carrying-out a processed substrate from the lock chamber.

2. (Twice Amended) A method of transferring at least one wafer in a vacuum processing apparatus, comprising the steps of:

(i) placing a cassette containing at least one wafer to be processed, at a cassette table, the cassette table having an upper region thereover which is open to a cassette transferring path;

(ii) loading said at least one wafer sequentially in order from said cassette, by means of a first conveyor, to a load lock chamber, in which one wafer is to be disposed, and therefrom, by means of a second conveyor, to a transfer chamber under vacuum; and

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(iii) after processing the wafers, unloading processed wafers from a plurality of vacuum processing chambers into said cassette at said cassette table, from which the wafers had been loaded, by means of the second conveyor in said transfer chamber under vacuum, an unload lock chamber, in which one wafer is to be disposed, and said first conveyor.

SUB 62 7  
3. (Thrice Amended) A method of transferring cassettes in operating a vacuum processing apparatus having plural vacuum processing chambers, the vacuum processing apparatus including:

an atmospheric loader, having a location for positioning at least one cassette containing samples, the location having an upper region which is open to a cassette transferring path;

a vacuum loader; and

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a lock chamber for connecting said atmospheric loader and said vacuum loader, said lock chamber having opening and closing devices for carrying-in samples to be processed in the vacuum processing chambers into the lock chamber and for carrying-out processed samples from the lock chamber, wherein

said atmospheric loader includes a cassette mount unit located in front of said lock chamber, and

said cassette mount unit has a cassette positioning plane in which all cassettes, containing the samples to be processed, are positioned in front of a front wall of said lock chamber, said cassette positioning plane being at said location,

the method comprising a step of:

placing said cassette on and removing said cassette from said cassette mount unit which is in front of said lock chamber while maintaining a surface of the samples substantially horizontal,

wherein the opening and closing devices of the lock chamber are opened and closed every carrying-in of a wafer, to be processed, to the lock chamber, and every carrying-out of a processed wafer from the lock chamber.

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5. (Amended) A method of transferring cassettes in operating a vacuum processing apparatus, the vacuum processing apparatus including:

an atmospheric loader, having a location for positioning at least one cassette containing samples, the

location having an upper region which is open to a cassette transferring path;

a vacuum loader: and

a lock chamber for connecting said atmospheric loader and said vacuum loader, wherein

said atmospheric loader includes a cassette mount unit located in front of said lock chamber, and

said cassette mount unit has a cassette positioning plane in which cassettes, containing samples to be processed, are positioned in front of a front wall of said lock chamber, said cassette positioning plane being at said location, and

an automatic cassette loader for loading cassettes into the atmospheric loader,

the method comprising a step of:

placing said cassette on and removing said cassette from said cassette positioning plane of said cassette mount unit by said automatic cassette loader, in accordance with data sent from a host control apparatus.

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7. (Amended) A method of operating a vacuum processing apparatus, the vacuum processing apparatus including:

an atmospheric loader, having a location for positioning at least one cassette containing samples, the location having an upper region which is open to a cassette transferring path;

a vacuum loader; and

a lock chamber for connecting said atmospheric loader and said vacuum loader, wherein

said atmospheric loader includes a cassette mount unit located in front of said lock chamber,

said cassette mount unit has a cassette positioning plane in which all cassettes, containing samples to be processed, are positioned in front of a front wall of said lock chamber, said cassette positioning plane being at said location, and

an automatic cassette loader for loading cassettes into the atmospheric loader,

the method comprising the steps of:

placing said cassette on said cassette positioning plane, in front of said lock chamber, and removing said cassette, by said automatic cassette loader in accordance with data sent from a host control apparatus; and

automatically executing a sample processing in said vacuum processing apparatus, based on processing data.

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9. (Twice Amended) A method of operating a vacuum processing apparatus, the vacuum processing apparatus including:

an atmospheric loader, having a location for positioning at least one cassette containing samples, the location having an upper region which is open to a cassette transferring path;

a vacuum loader; and

a lock chamber for connecting said atmospheric loader and said vacuum loader, said lock chamber having opening and closing devices for carrying-in samples, to be

processed, into the lock chamber and for carrying-out  
processed samples from the lock chamber, wherein

said atmospheric loader includes a cassette mount  
unit located outside of said lock chamber, and

said cassette mount unit has a cassette positioning  
plane in which all cassettes, containing samples to be  
processed, are positioned in front of a front wall of said  
lock chamber, said cassette positioning plane being at said  
location,

wherein the method comprises the steps of:

104 carrying in a sample, disposed under atmospheric  
pressure, from a cassette, at said location in said cassette  
positioning plane, positioned in front of the front wall of  
said lock chamber, into at least one of a plurality of vacuum  
processing chambers of said vacuum processing apparatus, using  
said lock chamber;

processing said sample in said at least one vacuum  
processing chamber; and

carrying out said sample, processed in said at least  
one vacuum processing chamber, into said atmospheric pressure,  
using said lock chamber,

wherein the opening and closing devices of the lock  
chamber are opened and closed every carrying-in of the sample,  
to be processed, to the lock chamber, and every carrying-out  
of the processed sample from the lock chamber.

105 11. (Twice Amended) A method of operating a vacuum  
processing apparatus, the vacuum processing apparatus

including:

an atmospheric loader, having a location for positioning at least one cassette containing samples, the location having an upper region which is open to a cassette transferring path;

a vacuum loader; and

a lock chamber for connecting said atmospheric loader and said vacuum loader, said lock chamber having opening and closing devices for carrying-in samples, to be processed, into the lock chamber and for carrying-out processed samples from the lock chamber, wherein

said atmospheric loader includes a cassette mount unit located outside of said lock chamber, and

said cassette mount unit has a cassette positioning plane in which all cassettes, containing samples to be processed, are positioned in front of a front wall of said lock chamber, said cassette positioning plane being at said location,

wherein the method comprises the steps of:

carrying in a sample, disposed in an atmosphere different than an atmosphere in a plurality of vacuum processing chambers, from a cassette positioned in front of the front wall of the lock chamber, at said location, into at least one of said vacuum processing chambers, using said lock chamber;

processing said sample in said at least one vacuum processing chamber; and

carrying out said sample, processed in said at least

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one vacuum processing chamber, into said atmosphere different from the atmosphere in said at least one vacuum processing chamber, using said lock chamber,

wherein the opening and closing devices of the lock chamber are opened and closed every carrying-in of a sample, to be processed, to the lock chamber, and every carrying-out of a processed sample from the lock chamber.

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13. (Thrice Amended) A method of treating a sample in plural vacuum processing chambers, comprising the steps of:

placing a cassette, containing the sample, at a position in front of a front wall of a lock chamber, on a cassette table, the cassette table having an upper region thereover which is open to a cassette transferring path, said lock chamber having opening and closing devices for carrying-in samples, to be processed, into the lock chamber and for carrying-out processed samples from the lock chamber;

carrying in the sample into a vacuum processing chamber, of the plural vacuum processing chambers, using the lock chamber;

processing said sample in said vacuum processing chamber;

carrying out said sample, processed in said vacuum processing chamber, to said cassette, using said lock chamber; and

removing said cassette from the cassette table, wherein the opening and closing devices of the lock chamber are opened and closed every carrying-in of a sample,

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to be processed, to the lock chamber, and every carrying-out of a processed sample from the lock chamber.

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15. (Thrice Amended) A method of treating a sample in plural vacuum processing chambers, comprising the steps of:

placing a cassette, containing the sample, on a cassette table, the cassette table having an upper region thereover which is open to a cassette transferring path;

carrying in the sample into a vacuum processing chamber, of the plural vacuum processing chambers, using a lock chamber, in which one sample is to be disposed;

processing said sample in said vacuum processing chamber;

carrying out said sample, processed in said vacuum processing chamber, to said cassette which had contained the sample prior to carrying the sample into the vacuum processing chamber, using said lock chamber, in which one sample is to be disposed; and

removing said cassette from the cassette table.

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16. (Twice Amended) A method of treating a sample, comprising the steps of:

placing a cassette, containing the sample, at a position in a single row in front of a front wall of a lock chamber, on a cassette table, the cassette table having an upper region thereover which is open to a cassette transferring path, said lock chamber having opening and closing devices for carrying-in samples, to be processed, into

the lock chamber and for carrying-out processed samples from the lock chamber;

carrying in the sample into a vacuum processing chamber, using the lock chamber;

processing said sample in said vacuum processing chamber; and

carrying out said sample, processed in said vacuum processing chamber, using said lock chamber,

wherein the opening and closing devices of the lock chamber are opened and closed every carrying-in of a sample, to be processed, to the lock chamber, and every carrying-out of the processed sample from the lock chamber.

10 <sup>sub 3</sup> 17. (Thrice Amended) A method of treating a semiconductor wafer in plural vacuum processing chambers, comprising the steps of:

placing a wafer storing structure, containing the semiconductor wafer, at a position in front of a front wall of a lock chamber, on a wafer storing structure table, the wafer storing structure table having an upper region thereover which is open to a wafer storing structure transfer path;

carrying in the semiconductor wafer into a vacuum processing chamber, of the plural vacuum processing chambers, using a lock chamber, in which one semiconductor wafer is to be disposed;

processing said semiconductor wafer in said vacuum processing chamber; and

carrying out said semiconductor wafer, processed in

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said vacuum processing chamber, to said wafer storing structure which had contained the semiconductor wafer prior to carrying the semiconductor wafer into the vacuum processing chamber, using said lock chamber, in which one semiconductor wafer is to be disposed.

SUB E4  
19. (Thrice Amended) A method of treating a semiconductor wafer in plural vacuum processing chambers, comprising the steps of:

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placing a wafer storing structure, containing the semiconductor wafer, at a position in front of a front wall of a lock chamber, in which one semiconductor wafer is to be disposed, on a wafer storing structure table, the wafer storing structure table having an upper region thereover which is open to a wafer storing structure transfer path;

carrying in the semiconductor wafer into a vacuum processing chamber, of the plural vacuum processing chambers, using the lock chamber;

processing said semiconductor wafer in said vacuum processing chamber; and

carrying out said semiconductor wafer, processed in said vacuum processing chamber, to said wafer storing structure which had contained the semiconductor wafer prior to carrying the semiconductor wafer into the vacuum processing chamber, using said lock chamber, in which one semiconductor wafer is to be disposed.

SUB E5  
21. (Thrice Amended) A method of treating a sample in

plural vacuum processing chambers, comprising the steps of:

placing a cassette, containing the sample, at a position in front of a front wall of a lock chamber, in which one sample is to be disposed, on a cassette table, the cassette being set at a position where an upper region thereof is open to a wafer storing structure transfer path;

carrying in the sample into a vacuum processing chamber, of the plural vacuum processing chambers, using the lock chamber, in which one sample is to be disposed, wherein the sample is carried directly from the cassette to the lock chamber;

processing said sample in said vacuum processing chamber; and

carrying out said sample, processed in said vacuum processing chamber, to said cassette which had contained the sample prior to carrying the sample into the vacuum processing chamber, using said lock chamber, in which one sample is to be disposed.

23. (Thrice Amended) A method of treating a sample in plural vacuum processing chambers, comprising the steps of:

placing a cassette, containing the sample, at a position in front of a front wall of a lock chamber, in which one sample is to be disposed, on a cassette table, the cassette being set at a position where an upper region thereof is open to a cassette transfer path;

carrying in the sample into a vacuum processing chamber, of the plural vacuum processing chambers, using the

lock chamber, in which one sample is to be disposed, wherein the sample is carried directly from the cassette to the lock chamber, samples being transferred from the cassette to the lock chamber;

processing said sample in said vacuum processing chamber; and

carrying out said sample, processed in said vacuum processing chamber, to said cassette from which the sample had been carried into the vacuum processing chamber, using said lock chamber, in which one sample is to be disposed.

SUB E7 25. (Thrice Amended) A method of treating a sample in plural vacuum processing chambers, comprising the steps of:

placing a cassette, containing the sample, at a position in a row in front of a front wall of a lock chamber, on a cassette table, disposed at a position where an upper region thereof is open to a cassette transfer path, said lock chamber having opening and closing devices for carrying-in samples, to be processed, into the lock chamber and for carrying-out processed samples from the lock chamber;

carrying in the sample into a vacuum processing chamber, of the plural vacuum processing chambers, using the lock chamber, whereby the sample is carried into the lock chamber from the cassette;

processing said sample in said vacuum processing chamber; and

carrying out said sample, processed in said vacuum processing chamber, using said lock chamber, whereby the

sample is carried out from the lock chamber to the cassette,  
wherein the sample is carried from the cassette to  
the lock chamber in a direction opposite to the direction in  
which the sample is carried out from the lock chamber to the  
cassette, and

wherein the opening and closing devices of the lock  
chamber are opened and closed every carrying-in of the sample,  
to be processed, to the lock chamber, and every carrying-out  
of the processed sample from the lock chamber.

26. (Thrice Amended) A method of treating a sample in  
plural vacuum processing chambers, comprising the steps of:

placing a cassette, containing the sample, at a  
position in a row in front of load and unload lock chambers,  
the load and unload lock chambers being separate chambers, the  
cassette being placed on a cassette table, disposed at a  
position where an upper region thereof is open to a cassette  
transfer path, each of the load and unload lock chambers  
having opening and closing devices for carrying-in a sample to  
be processed in a vacuum processing chamber to the load lock  
chamber and for carrying-out a processed sample from the  
unload lock chamber;

carrying in the sample into a vacuum processing  
chamber, of the plural vacuum processing chambers, using the  
load lock chamber;

processing said sample in said vacuum processing  
chamber; and

carrying out said sample, processed in said vacuum

processing chamber, using said unload lock chamber,

wherein the opening and closing devices of the load lock chamber are opened and closed every carrying-in of a sample, to be processed, to the load lock chamber, and every carrying-out of a processed sample from the unload lock chamber.

27. (Amended) A transfer method in operating a vacuum processing apparatus, the vacuum processing apparatus including:

a transfer chamber connected to plural vacuum processing chambers in which substrates to be processed are vacuum processed one-by-one;

a cassette table for mounting a cassette which receives plural substrates to be processed or substrates having been processed, said cassette being mounted at a position where an upper region thereof is open to a cassette transfer path;

a load lock chamber and an unload lock chamber, for carrying in and carrying out said substrates to be processed or said substrates having been processed, from and to said cassette mounted at said position, and for carrying in and carrying out said substrates to be processed or said substrates having been processed, from and to any of said vacuum processing chambers through said transfer chamber;

one atmospheric transfer apparatus for transferring said substrates to be processed or said substrates having been processed between said cassette mounted at said position and

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said load lock chamber and said unload lock chamber; and  
gate valves provided respectively at an atmospheric  
side and a vacuum side of said load lock chamber and said  
unload lock chamber and for opening and closing at every  
carry-in and carry-out time, one by one, of said substrates to  
be processed or said substrates having been processed so as to  
change over said load lock chamber and said unload lock  
chamber in an atmospheric atmosphere or a vacuum atmosphere;  
wherein the transfer method comprises:  
carrying in and carrying out said substrates to be  
processed or said substrates having been processed, one-by-  
one, between said load lock chamber or said unload lock  
chamber at said atmospheric atmosphere and said cassette  
mounted at said position.

28. (Amended) The transfer method according to claim  
27, including the further step of carrying in and carrying out  
said substrates to be processed or said substrates having been  
processed, one-by-one, between said load lock chamber or said  
unload lock chamber in the vacuum atmosphere and said cassette  
mounted at said position.

228 SUBES 30. (Amended) A transfer method in operating a vacuum  
processing apparatus, the vacuum processing apparatus  
including:

a transfer chamber connected to plural vacuum  
processing chambers in which substrates to be processed are  
vacuum processed one-by-one;

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a cassette table for mounting a cassette which receives plural substrates to be processed or substrates having been processed, the cassette being mounted at a position where an upper region thereof is open to a cassette transfer path;

a load lock chamber for carrying in said substrates to be processed from said cassette mounted at said position and for carrying out said substrates to be processed to any of said vacuum processing chambers through said transfer chamber;

an unload lock chamber for carrying in said substrates having been processed from any of said vacuum processing chambers through said transfer chamber and for carrying out said substrates having been processed to said cassette mounted at said position;

one atmospheric transfer apparatus for transferring said substrates to be processed or said substrates having been processed between said cassette mounted at said position and said load lock chamber and said unload lock chamber; and

gate valves provided respectively at an atmospheric side and a vacuum side of said load lock chamber and said unload lock chamber and for opening and closing at every carry-in and carry-out time, one-by-one of said substrates to be processed or said substrates having been processed so as to change over said load lock chamber or said unload lock chamber in an atmospheric atmosphere or a vacuum atmosphere,

wherein the transfer method comprises:

carrying in and carrying out said substrates to be processed or said substrates having been processed, one-by-

one, between said load lock chamber or said unload lock chamber in the atmospheric atmosphere and said cassette mounted at said position.

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31. (Amended) The transfer method according to claim 30, including the further step of carrying in and carrying out said substrates to be processed or said substrates having been processed, one-by-one, between said load lock chamber or said unload lock chamber in the vacuum atmosphere and said cassette mounted at said position.

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